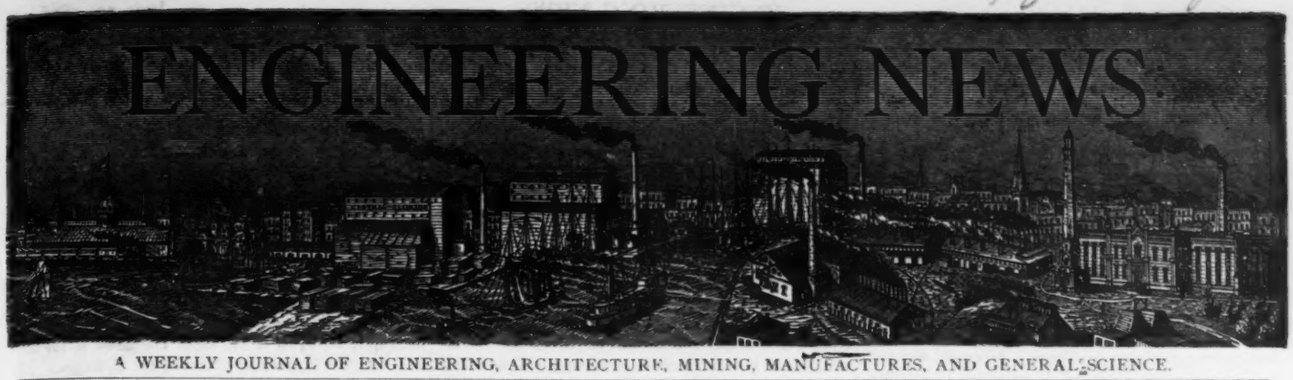
University of Michigan

ENGINEERING NEWS



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NOTES.

Lock 21, section 14, on the new Welland Canal was finished May 30th. This is the first lock completed. All the works are progressing favorably.

The British ship Challenger has just returned to England, having been engaged during almost the whole of the past four years in deep-sea soundings, dredging, etc.

The adddition of chloride of lime to mortar is suggested, as a means of preventing cracking in highly heated walls, and to give the mortar greater adhesive strength.

A contract has been entered into with responsible parties to dam the Kansas River and bring a canal through Topeka, creating 4,000 horse power of water. A company has also been organized to commence works for smelting silver ores.

M. Leverrier proposes to the French government to establish a system of warnings to colliery managers of probable falls of the barometer, the fact being now well established that the chance of explosions of fire-damp is seriously increased when the atmospheric pressure is lessened.

To obviate the dangers arising from dampness in brick buildings a French architect, M. Sebille, has patented a simple and inexpensive process for injecting brick, tiles and other earthern materials, with the tarry residue from the manufacture of illuminating gas. Brick thus prepared is said to be rendered absolutely waterproof.

Nails of every size and pattern are now made upon a commercial scale from Bessemer steel. With the exception of the annealing the manufacture is the same as for ordinary cut nails. They are reported as a great improvement over iron nails, while the cost is only a little more. Screws, bolts, and nuts are also under experiment, and will undoubtedly prove fully equal to the Bessemer nails.

At a meeting of the Asiatic Society of Bengal, in Calcutta, says *Chambers' Journal*, a piece of telegraph cable was exhibited, showing that the india-rubber covering had been pierced by grass. The piercing was so complete, and the contact of the grass with the copper ore so perfect, that "dead earth," as it is technically called, was produced and the efficiency of the cable destroyed. The species of the grass, owing to its dried-up condition, could not be determined. It was suggested as a probable explanation "that the seeds had become attached to the core when under water, and had afterwards germinated when the core was stored."

The Anthracite Coal Trade.

(From the Engineering and Mining Journal, June 3d.)

The action of the Combination in resolving to curtail the production of coal during the months of June and July, has had thus far, no perceptible effect upon buyers. Some of the individual firms claim a slightly increased business, but the large companies see no improvement. The retail dealers have but a very small demand from their customers, and are buying but little; and, in the present unsettled condition of trade, manufacturers do not anticipate their wants.

If there be any who still look for a disorganization of the Combination during this year, they are likely to be disappointed. The strength of the union is guaranteed by the individual weakness of the companies. There is not one of them that can afford to see it break, and no matter how threatening the situation may appear, it is likely to end by submission on the part of the offenders.

The stocks of the coal-carrying companies have depreciated very materially since the opening of the year, as has also their standings in financial circles. In their efforts to make at the end of the first six months what may appear very satisfactory statements, the managers of the companies have thoroughly demoralized trade, while the stock-holders will be no better, nor even as well off in the end.

The production of coal this year has been much greater than for the same period of 1875, but the amount of coal disposed of by the companies has not been nearly so great. The most demoralizing feature in the trade at present is the large stock of coal that has accumulated at various points. By curtailing production during June and July, it is hoped that this state of things will be alleviated; but it seems at present as if the quantity of coal to be sent to competitive points during this month—though the mines are to be worked only alternate weeks—is likely to be sufficient to supply all the requirements of the trade.

The fact that there is little demand, little use for coal is, of course, the self-evident immediate cause of the depression in the trade. But we seek for the more remote and ultimate causes, those that affect the demand in urging the necessity for cheaper coal as inducing a larger consumption, by enabling manufacturers in various industries to find a foreign outlet for their product, we do not for a moment suppose that a reduction of even a dollar a ton, to-day, would create at once a much greater demand, or immediately cause a revival of any business.

The whole case is summed up in the statement that our productive capacity, in many industries stimulated to an abnormal activity by various causes, has been increased beyond the consumptive requirements of the country even in ordinary "good times," and there can be no possible permanent revival in those industries till they can send their surplus out of the country. To enable them to do this they must secure a reduction in the cost of many items, one of which is coal.

It is worse than useless to suppose that we can change these facts by simply finding fault with them, the wisest course is to recognize and adapt ourselves to the new state of things, and the sooner we do so the sooner will we bring about that longed for revival that will give employment to all, even if it be at lower wages. So far as the miners in the anthracite region are concerned, we can see no hope for better times, till a large number leave the coal fields and seek in our Western gold and silver mines and in agriculture a subsistance that there is little prospect of their obtaining where they now are. They are now earning but "starvation wages" when we take account of the frequent "suspensions" they have to submit to, and they can do better almost anywhere in the West than they are likely to do for some time to come in the East, judging from present indications.

BITUMINOUS.

There has been no further important business report- in either Cumberland or Clearfield coals. From the orders already booked by the Clearfield companies they are likely to maintain their output, while the indications are that the Cumberland output will be reduced below even what it is at present. The decrease in business over the Cumberland railroads from January 1, 1876, to May 27, as compared with the corresponding period of 1875, was over 201,000 tons, being a decrease last week of over 19,000 tons. The Baltimore & Ohio R. R., and the Chesapeake & Ohio Canal each lost, for the week, in their receipts of Cumberland coal, as compared with the corresponding week of 1875, about 9,000 tons.

Improvements of the Ohio.

Major W. E. Merrill, U. S. Engineer, has, after several years' study, matured a plan for meeting the demand which Pittsburgh merchants have made for the radical improvement of the Ohio River from that city to its mouth. Their special desire has been to improve the harbor of Pittsburgh so as to secure a constant depth of navigable water throughout the Alleghany. Major Merrill's plan contemplates the use of movable dams, the first of which will be below McKee's Rocks, and is designated to raise the river surface 10 feet above low water so as to secure at Pittsburgh a constant depth of 6 feet at least. This plan would effect but little, if the Union bridge, which now has at low water from 37 feet 10 inches to 42 feet clearance under its different spans, is allowed to remain. A passenger packet's pilot house stands 48 feet above the water and those of first-class tow boats 40 to 46 feet. The bridge, therefore, prevents the passage of any but small boats, and improvements of the harbor would only increase the evil. The remedy for this is the insertion of draws in the bridges, with a least span at 120 feet.—*Galaxy.*

Hydraulic Shears.

A large pair of shears, just erected for the purpose of lifting very large guns, presents some features of interest on account of their size and peculiar construction. The shears consist of three upright tubular legs of iron, fastened together at the top; the pair in front, resting on trunnions placed at the edge of the dock, making the supports, while the third leg, extending to the rear, serves as a back-stay. When erect the top of the shears is 33 metres above the base, while the stay enables the load suspended between the uprights to move a horizontal distance of 14 metres. No hoisting chains, blocks, winding apparatus, or engines are employed, and the entire lifting power is obtained by means of an inverted hydraulic press suspended from the top of the shears. This press consists of an iron cylinder suspended at one end of the trunnions fixed at the top of the shears, so that it can swing freely backward and forward. The cylinder is 15 metres long, and has a piston with a stroke of 12 metres, while the load to be lifted is fastened by heavy links to the lower end of the piston rod. A small pipe conveys the water, under a pressure of 425 kilograms, up one of the legs of the shears, and then down the outside of the press to the bottom, where it enters below the piston, subject to control by valves governed by an attendant standing on a platform suspended near the bottom of the press. The longer leg, serving as a back-stay, is fastened at the bottom to a heavy hydraulic engine sunk in a masonry pit, and is arranged to travel backward and forward on slides securely fastened down.

When a load is to be shipped, the hydraulic engine draws the back-stay to the rear, and the shears become erect over the load. The piston is then allowed to fall to its full length, or till the links or chain on the piston rod can be secured to the load. The attendant then allows the water to enter the cylinder, and the piston is driven quickly upward, taking the load with it to a height of 12 metres, if desired. The hydraulic engine at the rear then begins to discharge, and the shears slowly tip over until the load overhangs the vessel. The water in the press is then allowed to escape, and the load is lowered in safety to the hold of the vessel. This application of an inverted hydraulic press to shears and cranes presents several advantages over the usual chains, locks and winding engines. The power is greater for the space occupied; it is more easily controlled, is more speedy, and there is less danger of a fall through breakage of chains.

A Report upon "Sanitary Relations to Health Principles of Architecture."

BY CARL PFEIFFER, ARCHITECT, F. A. I. A., OF NEW YORK.

A paper read at a Meeting of the American Public Health Association.

ARCHITECTURE MUST NOT BE WHOLLY ÆSTHETIC.

But there is this about architecture, that it must not give absolute and undivided supremacy to its æsthetical side. The sculptor, who models a statue, has only beauty in view; the architect, who builds a house, should primarily consider its adaptability to health and comfort, and then proceed to mould those ideas of health and comfort into the utmost possible picture of beauty. It is sometimes argued that ventilation is expensive, and that its cost precludes the general introduction of complete arrangements. To secure a considerable degree of salubrity in a dwelling at a trifling expense, is comparatively an easy achievement. In all the rooms flues may be constructed to allow the heat and the combustion of the gas to escape, and gas-burners may be placed within the ventilating flues and chimney flues over the mantel-piece, to create a strong current in order to facilitate ventilation. These can be covered (where they would necessarily show in the rooms) by pictures hung on hinges in front of the openings having the gas-burners within. The same mode of heating the ventilating flues can be adopted for ventilating other domestic conveniencies. Openings can be made and registers put into the partitions communicating with the halls, and these can be ventilated by skylights with ventilating cowls; these cowls will facilitate outward and prevent an inward current. In case it should be desirable to close all the windows and doors of the rooms, perforated iron blocks can be built into the exterior walls, upon a level with the flooring beams, and the space between two beams becomes a conduit for the fresh air, the outlet for it being placed (where possible) under the bed, by having a piece of the base board hung on hinges, with an opening behind it to admit the air. The placing of the ventilating registers in the ceilings instead of in the side walls of rooms, forms a feature of ornament, whereas in the side walls they are usually difficult to arrange without being an eyesore. For each flue in the ceiling a gas-light put into the same flue, upon and accessible from the floor above, heats the ventilating flue, and furnishes it with a more rapid current, and increased ventilation when desirable. The ventilating flues may also be connected with the heating flues by branch pipes for the purpose of exhausting the heat into the ventilating flues when it becomes necessary to shut off the heat, as it has often proved dangerous to shut the hot air registers and retain the heat within the flues. At the same time this exhausting of the superfluous heat into the ventilating flues greatly facilitates the draft of the ventilating flues. The main stairway of a house can also be made to form a great ventilating shaft, over which is formed a glass dome resting upon a cornice of stucco. The frieze of this cornice may be formed of perforated wood-work, representing a fine study of tropical foliage and birds.*

For the supply of fresh air to each room special flues can be provided and connected with a steam heating apparatus by which the air is warmed before it passes into the rooms.

IMPORTANCE OF GOOD DRAINAGE.

The matter of drainage is also to be well considered. All the soil and drain pipes should extend to the level of the roof, and the roof be so graded in various places as to conduct the rain water to the soil and drain-pipes; and as a further precaution against any smell from the drain, they should be connected by a ventilating pipe with the smoke flue beyond the Range, to guard against any odors that might otherwise escape from the drain pipe in case of their breaking. The importance of good drainage cannot be valued too highly in connection with public health. We find that the great plague of London and Westminster, in the 17th century, as shown by the parish registers of the Church of St. Margaret, has been attributed to the want of sufficient drainage and to the narrowness of the streets and lanes. A more recent and convincing proof is the late sickness of the Prince of Wales, caused by the insufficient drainage of Londesborough Lodge.

It is now fully admitted that warming and ventilating should be defined more particularly than has commonly been the case, previous to the erection of a new building, and incorporated with the structure from its first foundation. Since proper ventilation depends so largely upon a system of heating, I should perhaps say a few words upon several modes in use. The physiological effects resulting from particular modes of warming and ventilating inhabited rooms form a most interesting subject of inquiry and are not only interesting as matters of scientific research, but they closely concern every individual member of the community. It is a question which affects not merely the personal comfort of individuals, but according to the opinion of the ablest pathologists, it influences the health and affects the duration of life. Our dwellings are mostly heated by hot-air furnaces. The hot-air furnace in its present form was employed at the end of the last century by a Mr. Strutt of Belper, near Derby, for warming his cotton mills, and was soon after introduced into general use. Its distinctive feature is that its application of fire heat to metallic surfaces is a direct one without the intervention of either water or steam; and it is this feature which in my view makes it utterly objectionable, except perhaps in cases where the object is merely to produce a drying and warming effect of considerable intensity for specific manufacturing or laundry purposes. In all other cases it is to be utterly condemned. Indeed, there seems to be a general concession that the heat produced by hot-air furnaces is of the most injurious character in its influence upon health. Dizziness, coldness, and languor in the extremities, feebleness of pulse, fainting fits; such are some of the symptoms that have everywhere been noticed to accompany this mode of heating, undermining health in its most susceptible department, the nervous organization. Air heated thus artificially without contact of water, acquires an aridity which causes it rapidly to absorb moisture from the skin and lungs of persons exposed to its influences, and the evaporation, by its refrigerating effect, contracts the blood-vessels at the surface, while other parts not being exposed to this influence become in consequence surcharged with the fluids which are repelled from the extremities.

"There is a risk of dryness in air from highly heated metallic surfaces," says Professor Faraday, "which leads me to prefer it warmed by steam or hot water which gives lower temperature; sixty-five degrees by the latter mode will not cause the air to lose any of its humidity, but by the former mode the air requires vapor of water to correct it." All observers, indeed, are agreed on this injurious characteristic of heating with hot-air furnaces, as causing the absorption of the necessary humidity in the air of rooms, and thus inducing the nervous disorders before mentioned as well as being the cause of many other diseases. For as the dew-point † of the air in a room rises beyond its proper degree, the dryness of the atmosphere draws a quantum of moisture from one body altogether beyond what the body can well spare. The most healthy state of the atmosphere can be obtained only when the dew-point of the air is not less than ten degrees nor more than twenty degrees Fahrenheit lower than the temperature of the room. When these limits are exceeded the air will be either too dry or too damp for healthy respiration. Moreover, this dryness of the air which is the invariable result of hot-air furnaces deprives the atmosphere to an inordinate extent of positive electricity, whereas the evaporation produced by steam heating excites it, and thus relieves the unpleasant and injurious effect of close rooms. „So greatly does evaporation, affect the electric conditions of the air," says Mr. Hood, "that the diurnal variation in the quantity of electricity follows nearly the same course as the exhalation of moisture, and evaporation is considered to be the principal course of atmospheric electricity." Then, again, the air is always full of myriads of particles of animal and vegetable matter partly emanating from our bodies, and most of which are easily decomposed by heat, and experiments have demonstrated that the dry heat from metallic surfaces operates particularly most injuriously in effecting this decomposition. Hence the unpleasant smell in buildings thus heated, the atmosphere becoming a mass of putrid noxious matter. "And not only," says Mr. Hood, "will the hot-air furnace, which is particularly liable to these objections, act powerfully in decomposing the floating particles of extraneous matter contained in the air, resolving them into sulphuretted, phosphoretted, and carburetted hydrogen with various compounds of nitrogen and carbon, but it will likewise decompose a portion of the vapor contained in the air, absorbing the oxygen and liberating the hydrogen. To this must be added that the iron of the furnace, when heated to a glow, is rendered penetrable to the various hydrogen and carbonic gases of the burning material, which thus fill the air with additional impurities, and far from being an assisting agent in the ventilation of a building, the hot-air furnace considerably adds to the difficulty of providing the necessary ventilation. This is still more the case when the fire is kept high, for it has been fully established that air heated beyond a temperature of 212°–250° is unfit for breathing, and in furnaces it is often heated to a temperature of 300°–400°, at which it is, of course, utterly valueless for respiration. Indeed it is almost an impossibility with furnaces to get air heated within the limit specified. Surely it is difficult enough to provide large public buildings with ventilation sufficient to supply them with pure air, without increasing the difficulty by the introduction of a heating apparatus that of itself tends to fill the air with impurities while it does not assist at all in the ventilation, and this is particularly to be remembered in the construction of public halls, court-houses, churches, etc., for vitiated air invariably produces those stupefying effects of a narcotic dullness, drowsiness, headache, nausea, etc., and all such feelings which are utterly destructive of the state of mind above all needed in such buildings. It is not, however, simply a question of comfort, but a most important question of health that is involved in this matter of excluding furnaces from our public and private buildings. Few persons fully realize the vast consequences which result from impure air, and how seriously the duration of human life is affected by want of proper attention to this important subject. Dr. James Johnson says, that ague and fever, two of the most prominent features of the malarious influences, *are as a drop of water in the ocean* compared with the other less obtrusive but more dangerous maladies that silently disorganize the vital structure of the human fabric under the influence of this deleterious and invisible poison. Indeed, to compress the statement in a few words; Carbonic acid intoxication is the most terrible agent of disease, insanity and immorality which we have to deal with, all the more terrible and dangerous as it is indulged in by all classes, by all ranks. The inhabitant of the most wretched house on Baxter Street clings to the inhalation of impure air with the same fervor and love as the owner of the finest dwelling on Fifth Avenue, who carefully shuts out pure air under the pretext of excluding "draughts," and wraps himself up in the poisonous atmosphere as if it were of all things his best and dearest friend; and what I desire particularly to insist upon as one of the most effective elements in the spread of this carbonic acid intoxication is the hot-air furnace. It not only impairs ventilation but assists in the adulteration of air. To put a hot-air furnace in your house is like furnishing your milkman with chalk, or your wine merchant with strychnine.

While I have spoken against the use of furnace heat upon health principles, I am aware that it is not within the means of every one to have his house heated by steam or hot water. It would greatly mitigate the evils of furnaces if in houses where *one* furnace is commonly thought sufficient, *two* of them were used, in order to obtain the necessary heat without overheating the iron surfaces of the furnace and without burning the air.

In the construction of the furnace, cast iron should be avoided, wrought iron or soap stone should be used. In the distribution of furnace heat in houses the number of openings by which the heat is emitted into the rooms should be considerably increased, there should be several openings in an ordinary sized room instead of one, as is now the practice, so as to allow a greater diffusion of the heat.

* This, in a private residence built under the supervision of the architect, gives, at first appearance, the impression of elaborately carved work. It is made of flat wood, sawed out to give the outline of the foliage and birds, and the shading and detail of forms have been done in color. Through the perforations of this ornamental work the foul air passes into the space between the glass dome and the outer skylights, and it finds its exit through a ventilating cowl three feet in diameter. The glass dome is illuminated. The gas-lights answer the double purpose of features of ornament as well as great assistants in the ventilation, especially upon the occasion of a large entertainment when the house is filled with people, when by means of the heat of the gas, the impure air is being constantly drawn towards the dome, where it finds its exit. The gas flames cannot be seen below the dome.

† Dew-point is that thermometric temperature of the atmosphere at which vapor is condensed. By exposing a cold body to the air, a fine dew is deposited on its surface, and by observing the temperature of this cold body, the exact quantity of vapor contained in the air at that time is ascertained.

As I said at the beginning, sanitary architecture is a matter of trancendent importance to the human race. Vitiated atmosphere is quite as injurious and stupefying as the worst alcoholic drinks. It spoils every dinner, it kills sleep. It is the greatest enemy of the preacher, in that it makes people stupidly drowsy, and puts them asleep. It disarranges the whole natural organism, The judge and jury in a court-room filled with pestilential air, as most of our court-rooms are, are as much under the influence of a deathly narcotic as the inhalers of opium smoke.

The poorer classes of our large cities suffer probably most from this demoralizing breathing of polluted atmosphere. It is well to preach temperance, but is it not also well and of pre-eminent necessity to preach and procure clean, pure air, and healthy sunlight? Is it not worse than folly to refuse the cup from which your friend has drank, and at the same time breathe into the inmost recesses of your body the air from the lungs of a promiscuous crowd, whether in rooms, halls, churches, or street or railroad cars, or from a pestilential neighborhood? When we contemplate the almost universal fear of draught, that is to say, fresh air, which pervades almost all classes of modern society, and from the effects of which our little children are made to suffer even more yet than the adult generation, it seems that nothing could be more timely than a crusade against this carbonic acid intoxication, to which men are so hopelessly given. For this breathing of foul air is nothing but an intoxication, accompanied by all its evil effects, want of appetite, headache, sleeplessness, etc., and the cause of most of those sicknesses which are foolishly ascribed to pure air under the name of draughts. In conclusion allow me to say one word in regard to drainage, whereby I mean to include any kind of communication passing between the house and the ground upon which it is built. This ground is also porous (the more so, likewise, in proportion to its dryness), and is therefore also somewhat of a ventilator. At the same time, in the close streets of our large cities, where gas-pipes, sewers, etc., run through it to a vast extent, it is also filled with innumerable agents of danger to health, all of which require the most careful watching on the part of the architect, and against many of which science has not as yet provided. Particularly in winter when the house, if heated, draws, as it were, the atmosphere and gases of the adjoining ground into its rooms, are these elements dangerous and conspire to spread epidemics.

Equally important to a good system of heating is that of plumbing. Typhoid fever and dyphtheria are invariably produced by the escape of sewer gas caused by defective plumbing. The pipes should be of sufficient size and the joints well caulked and secured, waste pipes branching from a main pipe should not extend in a horizontal direction more than five or six feet without having a separate air or ventilating pipe for the "trap," otherwise the trap is liable to be syphoned. Rain water pipes should not be depended upon to ventilate the soil pipes; during severe rain storms they become overcharged with water and closed against the escape of air, and the sudden increase of water in the sewer compresses the air and forces the gases through the traps into our buildings. Another cause of the escape of sewer gas into our buildings is the evaporation of the water in the traps when the houses are not occupied. It ought to be the duty of every person left in charge of an unoccupied building to let the water pass through the pipes of every wash basin, bath, sink, or water-closet once a day of sufficient quantity to fill the traps.

The basins of water-closets should not be of a conical form, as commonly used, to which the excretions are apt to adhere and largely contribute to the impurity of the atmosphere of houses. The basins should be of a cylindrical form with perpendicular sides admitting of the excretions to fall into the water at the bottom without coming in contact with the sides of the basin and which would thus be more readily kept clean.

To guard against defective plumbing work, the same ought to be tested before it is made use of. The test to consist in stopping the waste pipes at the bottom, and all other outlets and before the wash basins, sinks, water closets, etc., are connected, to fill the pipes with water; this would produce sufficient pressure to test the quality of the waste and supply pipes and would prove whether the joints were perfect or not and secure in this way an important agent in the ventilation of our buildings.

I suppose you are all familiar with the case mentioned by Dr. Reid: where about fifty members of one of the Royal Society Clubs at Edinburgh dined in an apartment which he had constructed, so that the product of the gas combustion and the vitiated air were removed by a ventilating pipe, and large quantities of a mild scented fresh atmosphere constantly passed into the room. The gentlemen present at the banquet were unaware of this arrangement, which had such an effect upon them that the caterer was struck with the enormous and increased amount of food and wines dispatched with utmost ease and nonchalance by the same men whom he had so often seen languishing over a dinner in the same, but foul-aired room. Not one of them knew he had displayed an unusual appetite; and no one complained of headache or other indisposition at that dinner or afterward.

Thus, in the most manifold ways is public health connected with architecture; and thus does the Science of Hygiene depend upon the co-operation of the builder. If, by the statement of a few general principles and in a necessarily brief and fragmentary manner, I have succeeded in illustrating the co-operation and mutual dependence of this most noble art and this most beneficent science, I shall feel amply repaid for my endeavors.

(CONCLUDED.)

The Iowa City Bridge.

BY C. W. IRISH, C. E.

(Written for Engineering News.)

On the 20th of the past month a contract was let by the Board of Supervisors of Johnson County, Iowa, for the masonry and superstructure of an iron bridge across the Iowa River at Iowa City. The point selected for the bridge is at the old Folsome bridge site. The channel at this place is 300 feet wide and for some distance above and below is straight. The depth of the water at a low stage is about 7 feet. The bed of the river is composed of sand and mud resting upon a bed of rock; the depth of the muddy stratum is 11 feet.

The foundations of the bridge will consist of piles capped with the usual framing and covered with two courses of two inch plank all well packed and rip rapped with durable stone. By making use of the abutment now standing the masonry to be built will consist of one pier and one abutment dividing the crossing into two spans of 150 feet each. The height of the masonry will be 22 feet from foundation to bridge seat. The total amount of masonry is 340 cubic yards, to be built in a first-class manner, of the best material and was awarded to Messrs Shafer & Madden at $8.50 per cubic yard.

The bids upon the masonry and foundations were as follows:

	Of Blue Stone—per cubic yard.	Of North Bend Stone—per cubic yard.	North Bend Fall and Blue Stone backing—cu yrd	Piling per lineal foot.	Rip rap—per cubic yard	Total cost of superstructure by each bid.
Shafer & Madden..	$7.50	$ 9.50	$8.50	$0.50	$1.00	$3,915
Bealer & Co.....	7.50	11.00	9 00	0.70	2.00	4,761
Gülick & Co.....	9.00	.....	....	0.50	2.00	4,436
O'Hanlon & Hara.	8.50	14.00	....	0.55	1.00	4,100

The total cost of the superstructure by the first and second bids is based upon price per yard in the 4th column and by the 3d and 4th bids upon the price per yard in the 2d column of the above table.

The blue stone is qurried in the banks of the river immediately at the bridge site while the "North Bend" stone is qurried at the "Capitol" qurries about 12 miles from the place of construction. The "Blue" stone is a regular bedded bluish grey limestone weathering out a dusty yellow color from the iron it contains; it does not stand the action of moisture and frost well. The North Bend stone is a heavy bedded yellowish white limestone which will stand all the vciissitudes of the weather without material change for centuries.

Seven propositions for the superstructure were received. The prices given being for iron floor beams. The bids were as follows:

1. Raymond & Campbell, Council Bluffs, Ia.—Pratt truss, $41.90 per lineal foot.

2. Columbia Bridge Works, Dayton, O.—Double intersection truss, $37 per lineal foot.

3. King Bridge Co., Cleveland, O.—Pratt truss, $33 per lineal foot.

4. Clinton Smith Bridge Co., Clinton, Ia.—Truss bridge, $30.50 per lineal foot.

5. Clinton Smith Bridge Co., Clinton, Ia.—Combination Howe truss, top chord and diagonals wood, lower chord and uprights iron, with iron floor beams, $23.10 per lineal foot. The top chord is housed in by a galvanized iron roof.

6. Cincinnati Bridge Co., Cincinnati, O.—Whipple truss, $32.50 per lineal foot.

7. King Bridge Co., Cleveland, O.—Arch, $33 per lineal foot.

8. Cincinnati Bridge Co., Cincinnati, O.—Arch $30.-90 per lineal foot.

9. Canton Wrought Iron Bridge Co., Canton, O.—Arch, $26 per lineal foot.

10. Indianapolis Bridge Co., Indianapolis, Ind.—Arch, $32 per lineal foot.

No strain sheet was given with No. 1 that could be made use of.

2. No member in compression carries more than 8,-000 lbs. per square inch of section, nor does any member in tension carry more than 12 000 lbs. per square inch of section.

3. Strain sheet not seen.

4 and 5. Good models, and no part overstrained.

6. Strain sheet was not in a shape to admit of ready comparison.

7. At springing line, compression per square inch, 9,-783 lbs.; at crown 11,666 lbs. per square inch; tension upon chords 15,000 lbs. per square inch; greatest tension upon diagonals 15,200 lbs. per square inch; number of panels 22; rise of arch 11¼ feet.

8. Could not be compared for the same reasons of No. 6.

9. Compression at the springing line per square inch of section was 10,825 lbs.; at crown 10,084 per square inch; tension upon chords 15,900 lbs. per square inch; greatest tension upon diagonals 11,200 lbs.

10. Compression at springing line 13,800 lbs. per square inch; at crown 12,300 lbs. per square inch.

The specifications made by the Board of Supervisors called for a bridge 150 feet span, center to center, single roadway 17 feet in the clear, and two side walks 4 feet in the clear each. The bridge to carry a moving load of 2,000 per lineal foot and not strain the material of the bridge above one-fourth of its ultimate strength.

The ultimate strength of iron to be taken at 36,000 lbs. per square inch of section; 60,000 lbs. per square inch under tension; 45,000 lbs. per square inch under a shearing force, and all the members of the structure to be adapted to a factor of 4 for safety.

The committee having selected bid No. 9, notified the company to bring the structure to the above requirements which the agent contracted to do at the price in hio bid.

The trusses Nos. 2, 4 and 5 are first class. The arches were all overstrained more or less. This is a fault common to all the arch bridges of long span that I have seen put up in the West, some of them being strained nearly to the amount that engineers consider the ultimate strength of the material in them.

Railroad Fog Signal.

Among the many devices for stopping railroad trains by a signal from a distant station, is an electro-magnetic apparatus recently examined and approved by the French Minister of Public Works. It consists of a steam whistle on the engine, closed by a valve governed by a spring that is controlled by a common electro-magnet. From the magnet extends a wire down the side of the engine, and ending in a steel wire brush about 8 inches long, suspended just outside of and above the rail. At the signal post a small copper plate is set up about 4 inches from the rail, and on a level with the bottom of the brush on the engine; this is then connected with the signal service of the line.

On passing the signal, the brush on the engine sweeps over the copper plate and makes an instant connection with the line. The magnet is at once released, and by means of the spring the valve is opened and the whistle sounds. The driver is thus warned of danger, whether he sees the usual signal or not, or in spite of them if they are disarranged. If every signal station is supplied with this apparatus, the driver may be ordered to run slow to the next signal, to stop there, or to go on if the road is clear, according to a pre-arranged system of signals, and all of this quite independently of the usual sight signals. The apparatus is reported to work with precision and certainty, and has been officially recommended to all the French lines.

ENGINEERING NEWS.

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GEO. H. FROST, - Editor and Publisher.
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ANNUAL MEETINGS OF AMERICAN ENGINEERS.

There is no doubt that the ensuing two weeks will be ever memorable ones in the history of American engineering. Assembled in convention at Philadelphia will be a large representation of the leading members of the profession, both American and foreign, and we feel that we are safe in making the assertion that in this Centennial year there will not be on this continent an equally large assemblage of men possessed of the scientific attainments, practical knowledge, and executive ability that will distinguish the participants in the coming meetings.

The time is indeed a most auspicious one. The great Exhibition itself is one of the fittest tributes to the talent that could design, and the skill that could execute, the erection of the buildings; the construction of the means of transport, by sea and land, of the varied productions of the whole world; and the bringing together under one roof of the exhibition of mechanical skill of the nations. The men who located and constructed the first railways of this country, and those who have ever since been the leaders in the development of the canal and railway system of this country, will be there; the engineers who have designed and built the bridges, viaducts, tunnels, public buildings, and other monuments of engineering skill and knowledge will be present to take part in the proceedings; while the men who direct the working of the greatest manufacturing establishments in the land, and those who show the way to its mineral treasures, will be represented in large numbers. The societies who are to be in convention have invited the members of kindred societies to meet with them, and have no doubt made very ample preparation for receiving all who will come. The Trustees of the Franklin Institute have sent out invitations to the various scientific societies to make use of their rooms and library while in Philadelphia, and it is probable that a most hearty welcome will be extended to the engineers of America who may see fit to avail themselves of the opportunity to visit the Centennial during the coming fortnight.

The annual reception of the Institution of Civil Engineers in England is the occasion of the meeting with the Society of some of the most distinguished men of the nation, royalty itself usually lending its presence to add to the *eclat* of the event. The Engineering Societies of this country are gaining rapidly in numbers and influence and their annual conventions will undoubtedly henceforth be occasions of wide-spread public interest, and the best men of the nation will feel it a privilege to be present at them.

BY DECISION of the Courts, three out of five judges concurring, Colvin is acting Mayor of this city; Hoyne has retired to private life and municipal matters generally are in a muddle. A new election will be held as soon as possible, when, undoubtedly Colvin will be elected to stay at home and attend to the business of the Express Co. while a better man will be called to the office of Mayor. In the meantime the bummer element is jubilant and the employes of the city who were lately discharged by Hoyne are canvassing the question of whether they are in, or out, of office. As the Council is the governing power in city affairs, and the majority of that body, having neither fear nor respect for Mr. Colvin, it is probable that the Council meetings will be possessed of considerable interest for the next few days.

COLVIN has confirmed the action of Mr. Hoyne and the Council in dispensing with the office of City Marshal, but the Council did not agree with His Honor in abolishing the Board of Public Works, but voted to continue the office and the present incumbents. Several votes were also passed over Colvin's veto. The result of the coming election for Mayor will be awaited with considerable anxiety by the people of Chicago.

WE are in receipt of occasional complaints from subscribers about the failure of this paper to reach them. We can assure all such that the fault does not lie with us as we are so well aware of the injury that such failures must occasion us, that we are very careful about the directing and mailing of each issue, and if our subscribers could hear the explanations of the Superintendent of Mails given in reply to our inquiries in each case they would learn of a number of ways in which a paper may be lost, that is perhaps unsuspected by them. When several papers fail to come to any subscriber, it may be taken for granted that the subscription has either expired or something is wrong in the delivery. We mail our papers every Saturday and the most of them should be received by subscribers on Monday morning; when a paper fails to come at the usual time we will be obliged for a prompt notification, when we will send another copy at once.

Publications Received.

The Journal of the American Society of Civil Engineers, for April, 1876. New York

The Brighton Intercepting and Outfall Sewers; by John George Gamble, B. A. Assoc. Inst. C. E.

The Nursery for June. John L. Shorey, 38 Bromfield St., Boston, Mass. A perfect little gem for little folks.

Reports of the Road Commissioners and City Surveyor of New Haven, Ct., for the year ending Dec. 31, 1875.

Eleventh Annual Report of the City of Alleghany, Pa., for the fiscal year ending December 31st, 1875. Alleghany, 1876.

The Pneumatic Transmission of Telegrams; by Richard Spelman Culley, M. Inst. C. E., and Robert Sabine, Assoc. Inst. C. E.

Second Annual Report of the Geological aad Agricultural Survey of Texas, by S. B. Buckley, A. M., Ph. D., State Geologist. Houston, 1876

Illustrated Catalogue of the St. Louis Bolt and Iron Co. St. Louis, 1876.

A very neat publication of about sixty pages showing the manufactures of the above company—spikes, bolts, rivets, rails and their fastenings, &c., making a very handy book of reference for parties using these articles.

Narrow Gauge Railways in America; a sketch of their use, progress and success; valuable statistics as to grades, curves, weight of rails, locomotives, cars, etc.; also, a directory of narrow gauge railways in North America. By Howard Fleming. Illustrated; second edition.

The subject of Narrow Gauge Railways is attracting so much attention at the present time that any information concerning it is of considerable interest. This is evidenced by the continued demand for Mr. Fleming's book which has necessitated the issue of the second edition wherein the record of the narrow gauge railway construction is brought down to the present season. The subjects treated upon are given in the title, and we recommend the treatise to engineers, and all others who are interested in railway construction.

The Divining Rod, By Charles Latimer, C. E. Cleveland, 1876.

This is the paper called "Water Witching," read before the C. E. Club of the Northwest, Feb. 1, 1875, and of which an abstract was then given in ENGINEERING NEWS. Mr. Latimer has now published the entire paper in a neat pamphlet of eighty-three pages, and as we have received quite a number of private communications on the subject during the past year, we feel sure that those persons who are interested in the mysterious workings of the Divining Rod will be pleased to know that this very complete account of them substantiated by the well authenticated experiments of Mr. Latimer himself for a considerable number of years, is to be had by addressing the author at Cleveland, Ohio. We will take a future occasion to make some extracts from this interesting paper.

The Iron Trade.

The iron trade in all its branches is still in a very unsatisfactory condition. Repeated reductions in price have stimulated no additional demand, and even the complete shutting down of many large blast furnaces and rolling mills has given no steadiness to values. The owners of those which are still in operation have perforce resorted to a cutting down of the cost of production in order to meet the market, and here they have done wisely. Manufacturers who have closed their works have adopted the other policy of restricting production, and the latter class, unless their establishments are unfitted to the business, and hence unprofitable at even the lowest cost of production, have done foolishly. They have made the mistake of supposing that the panic was only a temporary aberration, and that the reaction would quickly set in that would carry prices up to about the old level, when they could recommence manufacturing at a profit, even while paying the old cost of production. The sooner the latter class realize that pig iron will not for years to come, sell above $20 and $25, and that, if they wish to continue in the business, they must make it cheap enough to sell at that range, the better for themselves and the trade.

We are aware that in this business an exceptionally large proportion of the cost of production is beyond the control of either merchant iron or pig manufacturers. If oar coal, and limestone continue high, they cannot profitably sell iron low, even though they pay the lowest market price for labor and economize in every possible manner. Since our manufacturers do not get these raw materials from the same sources as their foreign competitors, and hence pay different and generally higher prices they cannot compete in the markets of the world so readily as say the cotton manufacturers. Ore and limestone have already declined considerably in price, and in the new season beginning with the opening of lake navigation the former will sell much lower than for years. The high price of coal is at present the chief bar to the opening up of an export trade in iron. When this is reduced, as it certainly will be within a year or two, either through the voluntary action of the Combination or through the breaking up of the monopoly, a large and steady export trade in American irons will begin, particularly to Canada, the West Indies, Mexico, and the countries of South America. But, without waiting for the cheapening of the cost of production, it would be a very profitable undertaking for our iron manufacturers to begin to canvass those markets at once. That exporting is at any rate profitable at present is shown by the regular shipments from New York and Philadelphia, which are of an aggreate value of some $5,000,000 per annum. Like many other industries, the foreigners only need to know the quality and price of our goods and they will buy, even at the present values.—*Boston Commercial Bulletin.*

Mr Pack of Houston, Tex., has the compass and chain used by his great-grandfather in the survey of the land on which Cincinnati now stands.

The Engine for the Lowell Water Works, Constructed for the City of Lowell, Mass., 1871-2.

J. P. DAVIS, C. E., ENGINEER LOWELL WATER COMMISSIONERS.—DESIGNED BY ROBERT BRIGGS, C. E.

(From the Journal of the Franklin Institute.)

The engine for the Lowell water works was constructed to proposals issued by the Board of Water Commissioners of Lowell, which, with general specifications, were prepared by the Engineer for the Commissioners. The type of engine and its requirements in performance, and the controlling strength of parts were given, but both proposals and specifications left the design of the engine in the main in the hands of the bidder, and the following gives the result as erected by the Southwark Foundry,—Henry G. Morris, proprietor,—of which establishment the writer was at the time superintendent.

This engine is peculiar in the United States as being, without mechanical change, a specimen of the "Sampson" pumping engine of England. Its performance in duty of pumping has compared favorably with the reported standard of that engine. A full account of performance, together with a statement of the figures of construction, will be found in the *Journal*, Vol. C., page 305, where is also given the specification for the boilers—accompanying the engine, with plate.

SPECIFICATION OF A PUMPING ENGINE FOR THE CITY OF LOWELL, MASS., TO CONSIST OF

One Beam Pumping Engine, with two steam cylinders (one high pressure and one low pressure) with air pump and condenser on one arm of beam; and bucket and plunger, lift and force water pump, and fly wheel on the other arm of beam.

The dimensions and proportions of the parts are of sufficient size when working at the lowest probable duty of seventy-five millions. (American standard) to raise at least five millions U. S. gallons through a twenty-four inch main of about twenty-five hundred feet length to the height of one hundred and fifty-seven feet above level of supply.

GENERAL DESCRIPTION OF PARTS OF THE ENGINE.

There will be one main cast iron bed plate (cast in two pieces) which will form the base, and excepting only the outside pillow block of the fly wheel shaft, will carry and sustain independently from any other foundation or attachment, all the parts of the machine.

The main central column will be of such magnitude and strength as to be free from vibration when the engine is working with its maximum load, and will form the air chamber of three hundred and sixty feet contents above the delivery valve; four smaller columns from the corner of the bed-plate will sustain a (comparatively) light entablature which shall join into the capital of the main column; this entablature will serve to carry the anchor block of the parallel motion, and also as a platform around the upper moving parts of the engine. The pedestals for the beam pillow-block, will rest upon the capital of the central column. The style of the engine, architecturally, will be based upon the Roman-Doric example.

The beam will be double and of ample strength; the fly wheel end being curved upwards to preserve the equality of length of main centres of the beam, when the fly wheel shaft is moved outwards from the centre of the bed-plate, so as to allow the pump to be placed between the crank and the base of the central column.

The steam cylinders will be compound or high and low pressure, and will have such relative areas as to expand the steam eight times when it is cut off in the high pressure cylinder at seven-sixteenths the stroke. They will be cast from hard metal and steam jacketed all over, including heads and bottoms.

The low pressure cylinder will be placed at the extreme end of the beam, the high pressure cylinder being as close to it as can be arranged, so as to give the shortest steam connections. The cylinders will be carefully jacketed all over by a porous jacketing, outside of which will be heavy felt, encased in black walnut staves, with mouldings at base and top, and brass bands.

The heads will be covered with polished bonnets.

The valves will be balanced double-beat poppet, or balanced double-beat lantern ones, as preferred by the engineer.

The side pipes will have copper expansion rings to connect to the upper steam chests, and the supply side pipe to low pressure cylinder will have a copper expansion ring where connected to lower steam chest.

The cross over is effected by a twisted passage in the chest in centre of high pressure exhaust and low pressure side pipes. The side pipes will be covered in a similar manner to the steam cylinder.

All the steam valves will be moved by a cam shaft along the side of the engine, with cams acting upon rollers on rockshaft arms with lifters and lifter rods. The cams which move the steam valves will be made long and of the proper shape to be moved endwise upon the cam shaft as regulated by the governor, forming a variable cut-off after the German method. (The cam shaft will be tubular and the motion of the cut-off cams will be effected by a central rod).

The variation of cut-off will be from two-tenths to eight-tenths the stroke of the high pressure cylinder.

The air pump will be of the usual character with rubber valves on brass gratings. The air pump will have a crosshead and slides in place of being attached to the parallel motion. The condenser will be of the ordinary jet type, and will have ample dimensions (together with the air pump) for establishing and preserving the vacuum in the low pressure cylinder. Upon one side of the air pump will be attached a brass force air pump for supplying the air vessel, and for replacing the air absorbed by the water. Upon the other side of the air pump will be placed the force feed-water pump; these two pumps will be worked from the ends of the air pump crosshead.

The fly wheel connection is taken from the opposite extremity of the beam from the cylinders.

The fly wheel will be made in segments with bolts through the arms. The crank will be balanced on the fly wheel hub. All the moving parts will be balanced in the beam.

The pump will be "bucket and plunger" with one supply and two deliveries on each stroke; the relative area of bucket and plunger being such that there shall be as near as possible, an equality of labor on each half of the motion. The pump will have either slides or a trunk connection, as desired by the engineer. The gib and key will be above the top of plunger. The trunk will be removable from the plunger.

The pump depends from the bed plate, and the suction valve chamber will be attached to the body of the pump.

The arrangement will be such that by breaking the joint with the delivery valve chamber and that from the suction valve chamber to supply pipe, the pump with all its parts can be lifted out directly through the bed-plate. The delivery valve will be in a separate chamber placed on the bed plate between the the pump and the central column, and will be accessible by lifting a cover, A by-pass, with valve, will be placed on the pump to relieve the engine at starting. The suction valve will be double or triple beat (as preferred by the engineer) one and one-fourth times the area of the pump.* The bucket valve will be double beat. The bucket will have a broad surface with grooves in lieu of packing, and the delivery valve will be three beat and equal in area to a twenty-four inch pipe. The upper joint of the air chamber will be perfectly air tight under sixty pounds pressure of air. The discharge pipe from the air chamber will be provided with a twenty-four inch stop valve, and a thirty-six by twenty-four inch Tee will be placed in the passage under central column, or such other provisions will be made for this part of the machine as the circumstances may require. The supply pipe of thirty-six inches diameter and not over twelve feet in length will be furnished.

The main steam pipe will be of ample dimensions, and there will be an independent and separate supply steam pipe from the boilers to the jackets. Both main and supply steam pipes will be covered by porous materials, felting and walnut lagging with brass bands. There will be a return condensed water pipe from the jackets to the boilers, if they are low enough for the water to flow, or to a trap with connection to the hot well if not. There will be suitable injection valves and pipe connection to a point of supply within the engine room, and an overflow pipe from hot well to any point not beyond the wall of building. Man-holes will be provided for the air vessel, the supply valve and at any other point where occasional access is desirable.

There will be placed upon the outside main pedestal, a ball governor to regulate and render automatic the variable cut-off. The outside pedestal will be supported by a box bed-plate. All the necessary foundation bolts and washers to secure the engine to the masonry will be supplied.

There will be cast iron galleries around tops of the cylinders and upon the entablature, and a staircase from the floor, with finished hand rails and stanchions. Cast iron floor plates will cover all the openings in the bed-plate.

An enclosed space around the fly wheel and engine will be formed by a finished hand rail with stanchions made to rescure to the floor of engine room.

There will be provided, and suitably attached or mounted, two Richard's Indicators, one Bourbon steam gauge, one Bourbon vacuum gauge, one water pressure gauge one air level glass gauge; also, in walnut cabinet case, a complete set of steel spanner wrenches which shall "take" all the bolts and nuts.

Three bright screw wrenches, a set of chisels, a set of hand hammers and sledges, also one pair three-fold iron blocks, with thirty fathoms of six and one-fourth inch manilla rope, one pair Weston's differential blocks for five tons, one pair same for one ton, also all the levers and tools required for ordinary use about the machinery. There will be provided as duplicates, one set of spare brasses for the connecting and pump rods and main links, one complete set of spare gum valves for air pump and a spare valve for both suction and delivery of main pump. All journals will be provided with suitable oil cups and drip pans, and there will be suitable pipes and pans for conveying the condensed water from the stuffing boxes.

PARTICULAR DESCRIPTION OF PARTS OF ENGINE.

Bed-Plate, will be 45 feet long by 8 feet 6 inches wide by 2 feet 6 inches deep, and will weigh about 40,000 pounds.

Main Column. The shaft will be 6 feet 2 inches diameter (outside) at base, and 5 feet diameter (outside) at cap, and 17 feet high from bed plate to cap. The capital will be 7 feet square and 2 feet 3 inches high.

Bases for Beam Pedestal Blocks, will be 5 feet 3 inches by 2 feet 2 inches by 3 feet high.

Main Beam Pedestals. Bases 3 feet 4 inches by 1 foot 9 inches by 1 foot 3 inches to centres, journals 1 foot 2 inches diameter by 2 feet long. brass box in bottom 2½ inches thick, cast iron cap; both box and cap being lined with Babbit metal.

Main Beam will be double, 28 feet between centres, 6 feet deep in middle. flange 10 inches by 3 inches, and middle rib 10 by 3 (flange and rib round edges) webb or plate 2½ inches thick.

Steam End—Parallel Motion. Both cylinders will be connected to beams by a parallel motion formed with a main link, 5 feet long from centre to centre and 5 inches diameter in necks, and 5½ inches diameter in middle, to large cylinder crosshead with boxes 6 inches in diameter by 7 inches long, and a pair of side links, 5 feet long from centre to centre and 3¼ inches diameter in neck and 3¼ inches piston rod of large cylinder will be forked. The cross pin will be about 2 feet long. The crosshead for small cylinder will be 2 feet 4 inches long by 10 inches deep by 2¾ inches thick in middle, with journals 4½ inches diameter by 5 inches long.

Low Pressure Cylinder, 57 inches diameter by 8 feet stroke, 1¼ inches thick; the piston will be 12 inches deep and the rod 5 inches diameter.

High Pressure Cylinder, 36 inches diameter by 5 feet 1⅝ inches stroke, 1¼ inches thick; the piston will be 8 inches deep and the rod 4½ inches diameter.

Air Pump Connection. The rod will 16 feet long by 3¾ inches diameter at neck and 4½ inches diameter in middle; journals 3½ inches diameter by 4½ inches long.

Air Pump, 25 inches diameter by 3 feet stroke, brass lined, rod 3½ inches diameter and brass cased, brass buckets and seats for the foot and delivery valves.

Air Pressure Force Pump and Feed Water Force Pump will each be 3 inches diameter by 3 feet stroke.

Main Connecting Rod will be 24 feet 5 inches long by 5½ inches diameter in neck and 12 inches by 6 inches in middle, journal 7 inches diameter by 8½ inches long.

Crank will be of wrought iron, finished bright.

Crank Shaft will be of wrought iron, at least 10 feet 6 inches long by 17 inches diameter; journal 16 inches diameter by 2 feet 3 inches long.

Crank Shaft Pedestals. base 3 feet 9 inches by 1 foot 9 inches by 1 foot 3 inches to center; journal 1 foot 4 inches diameter by 2 feet 3 inches long; brass box in bottom 2½ inches thick, cast iron cap; both box and cap being lined with Babbit's metal.

Fly Wheel will be 25 feet diameter, and the rim will be of the required width and thickness to give a weight of about 65,000 pounds.

The Pump will be 36 inches diameter by 6 feet stroke and 1¼ inches thick; the plunger will be 25.45 inches diameter; the bucket will be of brass, 20 inches deep on the side, with grooves to form a water packing; the flanges of the pump and air vessel will by 2⅜ inches thick; the by-pass on the pump will by 4 inches diameter.

The Main Steam Pipe will be of wrought iron, welded 8 ins. diameter with wrought angle-iron flanges riveted and calked, and cast iron flange elbows. The jacket supply steam pipe will be of diameter in middle, with boxes 4½ inches diameter dy 5 inches long. The radius rods, anchor blocks, parallel rods, and back links will have corresponding dimensione as shown on drawing. The head of wrought iron, welded, 3 inches diameter with cast iron flange elbows. These pipes will be so arranged as to avoid any unfair strain on the joints by expansion and contraction. All steam pipes will be covered by porous covering, felt, and lagging of walnut with brass bands. The dimensions of other pipes, not given in detail, will be ample, and all connections conveniently and suitably made.

The Valves will be double beat, and for uniformity of size will each be seven inches diameter. The side pipes will be 10 inches internal diameter, and the exhaust will be 12 inches diameter between chest and condenser. The cam shaft will be 3½ inches diameter (tubular.) The cams will be 4½ inches radius on outside, The cam rolls will be 6 inches diameter. The cam roll arms and the wiper on rockshaft will be 18 inches long. The rockshaft will be 3 inches diameter. The lifter rods will be 2¼ inches diameter. To other parts, not specified in detail, adequate proportions will be given.

All Flanges will be faced full width, and those of the steam cylinder and the junction of the column with the capital will be scraped joints. In the latter joint a copper band ¼ inch by ¾ inch will be caulked inside the joint.

All Bolts and Nuts will be turned up under heads and nut faces, and the surfaces on which they rest will be faced off. All nuts likely to be used frequently will be case hardened.

All Connecting Rods, gibs and keys and shafts will be of wrought iron and finished.

All Centres (including main beam centre), crank and wrist pins, and piston rods, will be of steel aud finished.

All Glands and Stuffing Boxes will be bushed or made entirely of brass.

The Workmanship and Materials throughout will be equal to the best examples of English pumping engines.

The Steam Pistons will be fitted with Wheelock's patent steam packing.

*This was changed afterwards to an arrangement of seven double beat valves in the suction chamber, and four double beat valve in the delivery chamber.

Contractors' Intelligence.

The Waterous engine works of Brantford, Ontario, have offered to build water-works in the town of Perth—for fire protection—for the sum of $14,500.

H. A. Streeter, of the Globe Iron Works, of this city, has just completed and shipped the iron work for a new jail at Webster City, Hamilton Co., Iowa, and is also engaged in furnishing the iron work for a jail at Fowler, Benton Co., Ind. Martin & Scoville of Kankakee, Ills., are the general contractors for the latter structure.

The bids for the construction of a new bridge, for the Chicago, Milwaukee & St. Paul Railroad, over the Mississippi River, at La Crosse, Wis., were opened on the 1st inst, as follows:

Delaware Bridge Co., New York City, two bids,—$90,832–$92,432; Leighton Bridge & Iron Works, Rochester, N. Y.—$92.714; American Bridge Co., Chicago—$92,735; Kellogg Bridge Co., Buffalo, N. Y.—$104,944; Phœnixville Bridge Works, Philadelphia—$105,835; M. Lassig, Chicago, two bids—$109,100–$109,800; Baltimore Bridge Co., Baltimore, Md.—110,-545.50; Milwaukee Bridge & Iron Works, Milwaukee, Wis., two bids—$113,053–$114,893; Keystone Bridge Co., Pittsburgh, Pa.—$113,608; Detroit Bridge & Iron Works, Detroit, Mich.—114,000; Louisville Bridge & Iron Co., Louisville, Ky.—$114,450; L. Soulerin, Chicago, two bids—$137,500–$141,200. We do not learn that the award has yet been made.

American Society of Civil Engineers.

The Eighth Annual Convention of the Society will be held in Philadelphia, Tuesday, Wednesday and Thursday, June 13th, 14th and 15th.

Sessions for the consideration of professional subjects and of regular business will be held daily from 9½ o'clock A. M. to 1½ o'clock P. M., in the Judge's Hall, on the Centennial Grounds.

A reception to the Society will be given on Tuesday evening, at the Union League Club House, by the Philadelphia members; and one on Thursday evening, by a brother member.

No excursions outside of Philadelphia will be attempted, as all the spare time at disposal of members will be fully occupied in visiting the Exposition.

The Western Gallery of the Main Exhibition Building has been fitted up, and will be used by the Society as a place for exhibits of American engineering and for meeting during the Exposition.

Members can have their correspondence addressed in care of Mr. Bogart, Resident Secretary of the Centennial Commission of the Society, at the Main Exhibition Building, and will find letters and telegrams delivered at his desk.

It has not been deemed necessary to secure rooms in Philadelphia for members attending the Convention: a list of principal hotels, with prices and location, will be issued in time for members to select and engage quarters for themselves. In accordance with the rules governing Conventions, a list of topics to be considered, at the regular sessions is submitted, with references to the Papers treating these subjects published in the Journal since May, 1875.

The Erie road has completed the laying of a third rail between Buffalo and Elmira.

Frederic Krupp, the famous Prussian founder and gun-maker, has arrived to visit the Exhibition.

The Waterworks Commissioners of Milwaukee, Wis., for the year ending June 1st., 1876, collected for water rates the sum of $66,084.10.

The Intercolonial Railway will be opened throughout its entire length next month, when the running time from Halifax to Riviere du Loup will be twenty-two hours, or to Quebec twenty-eight hours.

PROPOSALS FOR CONTRACTS.

BRIDGE WORK.—Bids will be received at the office of the Commissioners of Hamilton Co., O., in Cincinnati, until Saturday, July 1st at 12 M., for masonry, excavation and superstructure for a bridge across Symmes Creek, on the road from Symmes to the Sixteen-mile Stand, Symmes township. Specifications can be seen at this office. Jos. B. Humphreys, Auditor,

BRICKS.—Bids will be received at the office of the Superintendent of the U. S. Custom House and Postoffice, St Louis Mo., until 12 M. June 14th for 1,500,000 hard burned bricks, for the E. S. Custom House and Postoffice at St. Louis, in accordance with specifications. Specifications, conditions, form of proposal, and any additional information may be had on application to Thos. Walsh, Superintendent.

BRIDGE WORK—Proposals will be received at the office of the County Commissioners of Hamilton Co., O., in Cincinnati, until 12 M., July 1st for making the approaches to three bridges in Sycamore Township: 1st, Over the Miami Canal, on the road from Glenwood to South Glendale; 2d, Over the Miami Canal, on the road from Glendale to Sharon; 3d, Over the West Branch of the East Fork of Millcreek, on the road from Glendale to Sharon. Specifications can be seen at this office. Jos. B. Humphreys, Auditor.

BRIDGE—Proposals will be received at the Auditor's office, Batavia, Ohio, until 12 M, June 28th, for the superstructure of the following bridges: Two spans 120 ft. each across East Fork Little Miami, near East Liberty; One span 165 ft. across same stream near Batavia; One span 130 ft. across Stone Lick, near the Catholic Church. Bidders will furnish their own plans and specifications. C. J. Harrison, Auditor.

BRIDGE—Bids will be received at the office of the Commissioners of Hamilton Co., O., in Cincinnati, until July 1st at 12 M. for masonry of the abutments of a bridge across Millcreek, on the road from Hartwell to Lockland, in Sycamore township. Specifications can be seen at this office. Also, for an iron superstructure at the same place, clear span 80 ft.; clear roadway, 18 ft. Bidders will furnish their own plans and specifications therefor. A full and complete strain sheet to accompany each plan. Said bridge must be of sufficient strength to sustain 100 pounds per square foot of floor surface beside its own weight; factor of safety 4 15,000 tension, 12,500 compression. Payments will be made in Hamilton Co. bonds, bearing interest at 7 per cent, By order of Commissioners. Joseph B Humphreys, Auditor.

BRIDGE—Proposals will be received by the Commissioners of Portage Co., Ohio, at their office in Ravenna, Ohio, up to 12 M July 1st, for the construction of a triple arch stone bridge over the Cuyahoga river on Main St., in the village of Kent, in Portage Co. Proposals will be for the entire masonry complete, in accordance with plans and specifications; proposals by the perch will not be considered. Plans and specifications for the above work will be on file in the County Auditor's office. Two piers and one abutment in this job is to be built to Spring Line, under the present bridge now standing, on or before November 1st 1876 and the entire work to be completed on or before September 1st 1877. Wm. Grinnell, Co. Auditor.

COURT HOUSE REPAIRS—Bids, with names of securities will be received at the office of the Co. Clerk, of Randolph County, Mo., until 12 M., June 26th, for extensive repairs on the court house at Huntsville. Plans and specifications to be seen at the above office at Huntsville, and at the office of C. B. Clark, architect, 719 Locust St. St. Louis. Payments made as the work progresses. By order of the County Court. Chas. Allin, County Clerk.

COURT HOUSE AND JAIL.—Proposals will be received by the Board of Co. Commissioners, at the office of the County Clerk until Thursday, June 15th, 1 P. M., for the building of a court house and jail, in Ford Co., Kansas. Said court house to be built of brick, 19 inch walls, 36 feet square and 24 feet high. Each bid must be accompanied with security, by bond of $2,000, conditioned for compliance with bid, if accepted. Plans and specifications can be seen at this office. Address, W. F. Sweeney, Clerk, Dodge City, Kan.

COUNTY PRISON EXTENSION—Proposals will be received by the Commissioners of Schuykill County, at their office, in the county court house, Pottsville, Pa., until 4 P. M., June 28th, for the roofing, plumbing and gas fitting, plastering, painting and glazing required for the extension of the Schuykill County Prison. Each of said proposals to be indorsed separately as above enumerated. Plans and specifications of the work may be seen at the Commissioners' office until June 24th. Morgan W. Fehr, Louis Blass, Patrick Collins, Commissioners. E. A. Schartel, Clerk.

INSANE ASYLUM—Bids will be received by the Trustees of the State Charitable Institutions at the Insane Asylum near Osawattomie, Kansas, until Friday, June 20th, 1876, at one o'clock P. M., for the erection of additions to the present Asylum, according to plans and specifications for the same, which may be seen at the Asylum, and also at the office of Haskell & Wood, Architects, Lawrence, Kansas. Each bid will be accompanied by a guarantee (blank forms of which may be had of Haskell & Wood, Architects), in the sum of one thousand dollars, signed by not less than two responsible parties, conditioned that the bidder will, if award is made to him, enter into contract for the work, and furnish satisfactory bonds for its faithful performance. Bids may be addressed to the undersigned Insane Asylum, Osawattomie, Kansas, or handed to the Secretary on the day of opening. All bidders are requested to be present at the Asylum on the day of opening (June 20th). By order of the Trustees. W. B. Slosson, Secretary.

MASON WORK.—Bids will be received at the office of the Clerk of the Board of Education of Cleveland, Ohio, until 12 M., Monday June 26th for the mason work on the Mayflower School addition. Plans and specifications may be seen and blank proposals obtained at the Clerk's office on and after June 12th. The bid for labor and materials must each be separately stated with the price thereof. No proposal will be entertained unless made on the blanks furnished by the Board. F. M. Sanderson, Chairman Building Com.

ST. ANTHONY'S FALLS IMPROVEMENT—Bids in duplicate will be received by the undersigned, at the U. S. Engineer's office, in St. Paul, Minn., until 12 o'clock, noon, June 29, 1876, for the following work at the Falls of St. Anthony, Minneapolis, Minn. 1. Furnishing the materials and constructing two dams on limestone ledge. 2. Filling a portion of the old tunnel and other passages under the lime rock above the dyke. For all information apply to F. U. Farquhar, Major of Engineers.

SCHOOL HOUSE—Proposals will be received by the Board of Directors of the Independent School District of Creston, Ia. for the erection of two story brick school house, until 10 A. M., June 15th according to plans and specifications at the the office of Frank Millard & Co., Burlington, Ia. All bids must be signed by those proposing to do the work, securely sealed and endorsed "proposals for erecting school house," and delivered to the Secretary before the hour above named, A. D. Temple. Secretary.

STATE HOUSE IMPROVEMENT—Proposals will be received by the Comptroller of the Treasury of the state of Ohio, for the proposed improvements of the ceiling and skylights of the Senate Chamber and the House of Representativer at Columbus, until 10 A. M., Friday, June 16th. Bids will be received separately for the following classes of work: 1st, all the wrought and cast iron work for the ceiling lights; 2d, all the sky lights complete; 3d, all the painting and the glazing of the ceiling lights; 4th, all the plastering and plaster enrichments. And also for the whole complete in one bid. Plans, specifications and instructions for the same are now file at the office of the Architect, 117 South High Street, Columbus, Ohio, for the inspection of bidders. Each bid must be accompanied by a guarantee of $1,000, so conditioned that if the bid is accepted the bidder will enter into a contract with a bond of double the amount of his bid. The work must be perfected and completed by October 15th, under a heavy penalty for failure to do so. All bids must be sealed and directed to the Comptroller of the Treasury, and indorsed for what class of work they are intended. W. T. Wilson, Comptroller Treasury, T. R. Tinsley, Architect.

SEWER—Proposals will be received at the office of the Board of Public Works of Cleveland, O., until 12 M. June 15th for constructing a sewer in Danton Av., between Hopkins and Gest Sts., in accordance with plans and specifications on file at this office. John E. Bell, President.

SCHOOL HOUSE—Proposals will be received at the office of the Clerk of the Board of Education of Norwalk township, Huron Co., O., until 12 M., June 24th for building a brick school house on the lot situated in sub-district No. 2 of said township, according to the plans and specifications on file in said office. The bid for each kind of material called for by the specifications must be stated separately, and the price of each must be separately stated. By order of the Board of Education. H. L. Kennan, Clerk, No. 4, St. Charles Block, Norwalk, O.

STATE BUILDING—Proposals for furnishing all materials and the erection of a fish state hatching house, and also a tenement house, to be erected at the Nine Springs, in Fitchburg three miles southwest of West Madison depot, according to plans and specifications thereof, will be received by the Fish Commissioners of Wisconsin, at the law office of Welch & Botkin, 23 Pinckney Street, city of Madison, where plans and specifications can be seen, 12 M., Monday, June 26th. Separate proposals will be received for the two buildings to be erected. Fish Commissioners.

STREET IMPROVEMENT—Bids will be received at the office of the Board of Improvements of Cleveland, O., until 12 M. June 23d, to furnish and lay stone flagging for sidewalks for the ensuing year. The city is to be divided into three or more districts and proposals will be received for each district separately. Sealed proposals will also be received at the above mentioned time and place for furnishing any laying crosswalk stone at street crossings for the ensuing year. Also, proposals will be received separately for furnishing and laying. And, proposals for cross-walks will be received for the East and West Side separately. Specifications and blank proposals can be obtained at the office of the City Civil Engineer. By order of the Board. M, G. Watterson, Clerk.

SCHOOL HOUSE—Proposals will be received at the Township Clerk's office of Franklin Township, Summit Co., O., until 12 M., June 14th, for building a school house on the lot located in Sub-district No. 5 of said township, according to plans and specifications on file with the Township Clerk. The bids for each kind of material called for in the specifications must be separately stated. By order of the Township School Board. Hiram Dissinger, Clerk.

SCHOOL HOUSE—Proposals will be received by the School Board of the Independent school district of Pella, Ia., until noon June 17th, for the erection of a school house, plans and specifications of which can be seen at the office of C. Rhynsburger, Pella, Iowa. Bids may be made as follows: 1, excavation, draining and grading; 2, stone and brick work of entire foundation; 3, all brick and stone work above foundation; 5, carpenter work on entire building; 5, painting and glazing, also all tin or iron work in and about building including gutters; 6, entire building, covering all above named separate items. Address D. S. Huber or C. Rhynsburger, Pella, Iowa.

STEAM HEATING APPARATUS AND BOILER—Proposals will be received by the Regents of the University of Wisconsin for putting a steam apparatus to heat about 750,000 cubic feet, in their new Science Hall building. Also, separate proposals for furnishing a low pressure steam boiler of 8 feet diameter and 26 feet length. The plans and specifications for both classes of work can be seen in Milwaukee, at the office of H. C. Kock, architect, where any information in relation thereto can be had. Proposals will be received by John S. Dean, Secretary, at Madison: Wis., before June 18th, will be considered, and if satisfactory to the Regents, the work will be contracted for. N. B. Van Slyke, Chairman Building Committee.

STATE EDUCATIONAL INSTITUTION.—Proposals for furnishing material and the erection of the main building of the Institution for the Education of the Blind, in the city of Janesville, Wisconsin, according to the plans and specifications thereof, will be received by the undersigned, at his office, No. 6 East Milwaukee Street, Janesville, Wis., until 12 o'clock noon, June 15th 1876. The plans and specifications may be examined at the office of A. Anderson, architect, (under whose supervision the work will be done), at No. 37 West Milwaukee Street, Janesville, from and after June 1st 1876. Proposals may be made separately for mason work, including the cast iron work connected therewith; and for carpenter work, including galvanized and wrought iron work, tin work, painting and glazing. Proposals will also be received for doing the entire work. For further particulars address or call upon the undersigned. J. B. Whiting, Secretary of the Board of Trustees of the Wisconsin Institution for the Education of the Blind.

TOWN BUILDING—Proposals will be received by the Clerk of the incorporated village of Harrison, Hamilton Co., O, until 12 M., Thursday, June 22d, for the erection of a new town hall building. It will be understood by each bidder that a reserve of 15 per cent will be held until the building is completed and accepted by the Superintending Architect and Building Committee. Work to commence immediately after the letting. For plans and specifications call on the undersigned, Town Clerk, Harrison, Ohio, or on Parsons & Co., architects, Indianapolis, Indiana. By order of the Council. J. F. McManaman, Town Clerk.

WATER PIPES—Proposals will be received at the City Recorder's office, in Winona, Minn., until June 17th for cast iron water pipes (precise quantities to be determined at the time of awarding contract) as follows: 1550 ft. of 12 in; 2250 ft. of 10 in.; 1160 ft. of 6 in.; 800 ft. of 4 in.; special castings to be used in connection therewith; pipes and castings to be coated inside and outside with coal tar varnish and tested to 300 lbs. hydrostatic pressure. The proposals must specify the price per ton of 2,000 lbs delivered at railroad depots or levee in this city prior to July 17th, and also the price per ton for special castings delivered as afore said. The weight per foot of each kind of pipe must also be stated. In case the contract is awarded, a bond, with sureties approved, will be required for the faithful performance of the contract. Proposals must be indorsed: "Bids for delivery of Water Pipes." Chas. F. Schroth, Recorder.

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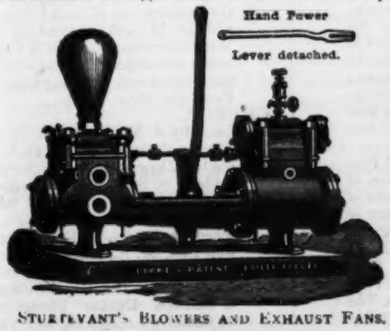

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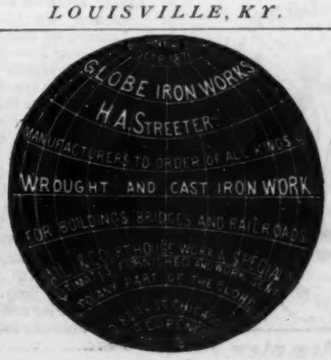
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